S S
6 622.3493
B M7u

Uranium Solution Extraction: The Process & the Law

MONTANA DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION

THOMAS L. JUDGE, GOVERNOR
~~XXXXXXXX~~ DIRECTOR John C. Orth

MEMBERS OF THE BOARD
~~XXXXXXXXXXXXXXXX~~ Charles Hash
VIOLA HERAK
DR. WILSON F. CLARK
~~XXXXXXXX~~ Roy Huffman
~~SEAN HANSON~~
WILLIAM BERTSCHE
CECIL WEEDING, Chairman
DAVID G. DRUM

449-3712
32 SOUTH EWING
NATURAL RESOURCES BUILDING
HELENA, MONTANA 59601

NO. 177
STATE DOCUMENTS

February 16, 1977

Honorable Thomas L. Judge
Governor of Montana
State Capitol Building
Helena, MT 59601

and

Senator W. Gordon McOmber, President of the Senate
Representative John C. Driscoll, Speaker of the House
Forty-fifth Legislative Assembly
Helena, MT 59601

Gentlemen:

Noting the state policy to provide for the protection of Montana's land and water resources, the 44th Legislative Assembly in 1975 enacted Senate Bill No. 374 concerning the control of uranium solution extraction and the rehabilitation of lands and waters thereby affected.

Specifically, the Department of Natural Resources and Conservation was directed to review its authority and the authority of other state and federal agencies to control or regulate solution extraction of uranium. This Department was further instructed to report and make recommendations to the Governor and to the 1977 Legislature. Finally, a two-year moratorium (ending April 8, 1977) was imposed on proposing, constructing, or in any way undertaking a uranium solution extraction operation.

The enclosed report has been compiled in accordance with this legislative directive; a copy of Senate Bill No. 374 (Section 50-1701 et seq., R.C.M. 1947) is also attached.

Sincerely,

John C. Orth

JOHN C. ORTH
DIRECTOR

JCO/CIM:bjh
Enclosures

Montana State Library
3 0864 1006 4636 6
MSL Jan 11 '79
MSL FEB 28 '79
MSL FEB 27 '80
MSL APR 2 '80

There have been no discoveries of commercial quality uranium ore in Montana. Adoption of solution mining techniques for development of uranium ores may change the definition of "commercial quality" ore. Should this occur... likely areas for discovery of exploitable uranium ore in Montana lie within the Big Hole drainage, the Ruby Valley and the Carbon County quadrant in eastern Montana. Some quantities of pitchblende have been noted in northwestern Montana near the Idaho border.

--Montana Energy Advisory Council, A Need for Balance: Montana Energy and Growth Policies, January 1977.

FEBRUARY 1977

URANIUM SOLUTION EXTRACTION: THE PROCESS AND THE LAW

Uranium occurs in many kinds of geologic situations and deposits. Found in small but significant amounts in such rocks as coal, black shale, and granite, uranium sometimes also occurs in greater concentrations, similar to the way other metals are concentrated in ore bodies. The kind of uranium deposit best suited for solution mining is in permeable sandstone aquifers and in minerals that are easily solubilized by an oxidizing agent.

In 1975, the 44th Session of the Montana Legislature found:

> ...that the energy shortage has prompted a widespread search for energy resources; that there is [sic] substantially increased prospecting, exploration and land acquisition for uranium in Montana ... [and] that solution extraction of uranium constitutes a technologically feasible method of uranium extraction which threatens Montana's land and water resources...
>
> --Senate Bill No. 374.

The policy declared by Senate Bill No. 374 (now Section 50-1701 *et seq.*, R.C.M. 1947, and herein called the Uranium

Solution Extraction Act) was to provide for the protection of the lands and waters of the state and therefore to provide for the control of uranium extraction and the rehabilitation of lands and waters affected by such extraction. The Department of Natural Resources and Conservation was directed to review current regulation of the solution extraction of uranium and to prepare a report, with recommendations.

The following information has been compiled pursuant to that legislative directive.

Description of the Process

Solution mining is the extraction of an ore by the in-place dissolution of the mineral with a leaching solution. Several kinds of mineral commodities can be removed by solution techniques, and significant variations of the basic technique can be used, even with the same mineral.

As a very general description of the process, the ore body is penetrated by a pattern of wells, through some of which the dissolving agent is pumped. The solution containing the mineral is withdrawn through the other wells, treated at the surface to yield the mined material, and, with its chemicals replenished, reinjected into the ore body.

For solution mining to be practical, a number of conditions must be met:

1. The valuable mineral or ore must be soluble in water or a chemical solution,

2. The surface area in the ore body must be sufficient to allow the solution to dissolve the mineral at a rate which would make production economical, and

3. The costs involved in solution mining must be less than the value of the ore produced and generally must not exceed the cost of conventional mining techniques.

Several companies, primarily in Texas and Wyoming, are developing solution mining techniques which are applicable to certain kinds of uranium deposits. Arco, Mobil Oil, and Westinghouse Electric are among those which have obtained permits; two companies have commercial production plants in operation.

Commercial production in Texas, reported to involve sites of perhaps 5 to 10 acres at a time, does not disturb the surface except for the well drilling and the maze of pipes, pumps, and chemical treatment plants needed to operate the system. Large amounts of water are neither required nor disposed of at the surface; almost none is consumed. The amounts of chemicals needed and uranium produced are both comparatively modest, ranging from several hundred to a few thousand pounds.

Because of the value of uranium, it is economical to mine low grade ores and small bodies of higher grade ore. Solution mining is being used at this time to exploit only these kinds of deposits.

As the process of solution mining is developed, it may be applied to quite different kinds of deposits -- for instance, to an ore body existing in rock which is not an

aquifer. If the ore body were too small, too deep, or too radioactive to be mined by conventional methods, solution mining techniques might be used. However, if the rock is not an aquifer, permeability might have to be induced by hydro-fracturing or by the use of explosives to allow the solution to act on the uranium-bearing minerals. Consequently, the techniques which may be developed and applied in a variety of geological settings may be very dissimilar to those now in operation or those being developed.

Authority of Federal Agencies

In-place uranium mining is licensed by the federal government pursuant to the Atomic Energy Act of 1954 (42 U.S.C. §2011 et seq.). Regulations have been adopted in compliance with this act at Title 10, Part 40 of the Code of Federal Regulations (10 C.F.R. 40). Further, in-place mining is under the jurisdiction of the Mining Enforcement and Safety Administration (MESA) of the U. S. Department of the Interior. MESA regulations are codified at 30 C.F.R. 1.1 et seq.

Basically, the federal legislation concerns:

1. The regulation of the production and utilization of atomic energy, special nuclear material, and source material (regulated by the Nuclear Regulatory Commission), and

2. The prescription of health and safety standards for the protection of life, the promotion of health and safety, and the prevention of accidents concerning individuals operating the mining facilities (regulated by MESA).

The Atomic Energy Act allows a state to enter into an agreement with the Nuclear Regulatory Commission (formerly the Atomic Energy Commission) whereby the state may exercise regulatory authority over all sources of radiation, except in instances dealing with source and special nuclear materials in quantities of critical mass. Such states are generally referred to as "Agreement States."

In order to become an "Agreement State," the governor of the state must certify that the state has a program for the control of radiation hazards, and that the state desires to assume regulatory responsibilities. The Commission must then find that the state program is compatible with the Commission's program for regulation of the materials, and that the state program is adequate to protect the public health and safety with respect to the materials covered by the proposed agreement.

In states which do not agree to do their own radioactive source material licensing (commonly referred to as "Non-Agreement States"), uranium solution mining is classified as a "mill," which is subject to the federal licensing process. However, even in the case of "Non-Agreement States," the federal government has not assumed all authority to regulate uranium extraction mining. Any state, whether an "Agreement

State" or a "Non-Agreement State," retains the authority to legislate for the regulation of activities and protection of the health and safety of its citizens (other than protection against radiation hazards).

Authority of Montana Agencies

Pursuant to Section 69-5801 *et seq.*, R.C.M. 1947 (herein called the Radiation Control Act), Montana has the authority to enter into an agreement with the federal government. However, because that authority has not been exercised, Montana is a "Non-Agreement State" and cannot administer radioactive source licensing. Consequently, in-place mining of uranium in Montana would be licensed pursuant to regulations under the federal Atomic Energy Act. Such an operation would also be under the jurisdiction of MESA and, therefore, subject to MESA regulations.

Nevertheless, except in matters of radiation hazards, Montana has the authority to enact legislation regulating uranium solution mining for the protection of the health and safety of state residents. Therefore, the question is whether existing state laws and rules provide for control of the uranium solution extraction process and the rehabilitation of the lands and water thereby affected.

Department of State Lands

The mining reclamation laws which are in effect in

Montana do not provide for the control mandated. Such laws specifically exempt either the mineral (uranium) or the process followed in the extraction of the mineral (injection of a solvent into zones below the earth's surface and subsequent withdrawal of the solution) from the scope of the legislation. Therefore, the Department of State Lands does not presently have the authority to control or regulate solution extraction of uranium.

Department of Natural Resources and Conservation

With regard to mining activities involving state waters, the Department of Natural Resources and Conservation has enforcement authority under both the Montana Ground Water Code (Section 89-2911 *et seq.*, R.C.M. 1947) and the Montana Water Use Act (Section 89-865 *et seq.*, R.C.M. 1947). The Montana Major Facility Siting Act (Section 70-801 *et seq.*, R.C.M. 1947) is also administered by this Department. The issue of immediate concern is whether these laws can be invoked to meet the legislative mandate of the Uranium Solution Extraction Act.

Ground Water Code -- Under this law, mining is a beneficial use for which ground water may be appropriated. The Department has no authority under the Ground Water Code to license or permit mining activities that require the injection

of a solvent into an aquifer and thereby contaminate the waters of the aquifer; in fact, the Department is mandated to order wells producing waters which contaminate other waters to be plugged or capped. The power is not discretionary. Therefore, while the Ground Water Code probably does not prohibit solution mining activities, neither is it a practical alternative for regulating those activities.

Water Use Act -- The purpose of this law is to provide for the administration, control, and regulation of water rights and the establishment of a centralized recording system of all water rights.

As related to uranium solution mining, any diversion, impoundment, or withdrawal of waters for this purpose must be made in accordance with the Water Use Act. If the operator does not have an existing water right, a permit must be secured to appropriate the water necessary for the beneficial use (in this case, the mining process).

Upon receipt of an application, the Department is required to issue a permit if:

(1) there are unappropriated waters in the source of supply;
(2) the rights of a prior appropriator will not be adversely affected;
(3) the proposed means of diversion or construction are adequate;
(4) the proposed use of water is a beneficial use;
(5) the proposed use will not interfere unreasonably with other planned uses or developments for which a permit has been issued or for which water has been reserved; and

(6) an applicant for an appropriation of fifteen cubic feet per second or more proves by clear and convincing evidence that the rights of a prior appropriator will not be adversely affected.

-- Section 89-885, R.C.M. 1947.

Once these criteria have been met, the Department must issue the permit to appropriate water. The permit can be made subject to certain conditions; however, the Department's authority to condition the permit does not appear to be broad enough to provide for the rehabilitation of lands affected by the mining process.

The Water Use Act authorizes the Board of Natural Resources and Conservation to adopt rules to regulate the construction, use, and sealing of wells to prevent the waste, contamination, or pollution of ground water. A "well" is defined in this statute as "any artificial opening or excavation in the ground, however made, by which groundwater is sought or through which it flows under natural pressures or is artificially withdrawn." It therefore appears that the Board's rule-making authority may be sufficiently broad to allow adoption of regulations concerning the use of wells in a solution extraction mining process which involves an aquifer. No such rules have been adopted.

However, the Board's authority to regulate solution extraction mining pursuant to this rule-making authorization may be questioned from the standpoint that the rules must provide for the prevention of waste, contamination, or

pollution of ground water. The fact is that the introduction of a foreign solution into a uranium-bearing zone will materially change the character of any ground water in that zone. Consequently, the ground water is contaminated at least during the mining operation. In effect, adopting rules pursuant to the Water Use Act to govern solution extraction mining (i.e., allowing contamination at least during the life of the mining operation) would be tantamount to allowing an activity that the act is apparently designed to prevent (i.e., contaminating ground water in light of a statute calling for the prevention of contamination).

It must be noted that, if it is determined that a state agency other than the Department of Natural Resources and Conservation should regulate uranium solution mining in Montana, water appropriations necessary for the mining operations would remain within the jurisdiction of the Department of Natural Resources and Conservation.

Major Facility Siting Act -- Arguably, the Department and the Board of Natural Resources and Conservation may have authority to regulate uranium solution mining pursuant to the Montana Major Facility Siting Act. In this statute, one of the definitions of "facility" is a "plant...designed for, or capable of, enriching uranium minerals, or any addition thereto..." If the phrase "enriching uranium minerals" can be interpreted to mean the concentrating of uranium, the Board of Natural Resources and Conservation must certify

such a facility and condition its construction, operation, and maintenance so as to provide for the control of uranium solution extraction and the protection and rehabilitation of lands and waters thereby affected.

Department of Health and Environmental Sciences

The Department of Health and Environmental Sciences' possible authority to regulate the uranium solution extraction process can be assessed by examining two statutes.

Radiation Control Act -- As previously noted, this 1967 legislation authorized the governor, on behalf of the state, to enter into agreements with the federal government which would allow the state to exercise regulatory authority over all sources of radiation. The act also named the Department of Health and Environmental Sciences as the state radiation control agency. As such, the Department of Health and Environmental Sciences has the authority to develop programs and adopt rules with regard to compatibility with federal programs for licensing and regulation of by-product, source, radioactive waste materials, special nuclear materials, and other radioactive materials. In part such rules are intended to cover equipment and facilities.

The State of Arizona, under a statute (Section 30-651 et seq., Arizona Revised Statutes) similar to that of Montana, has assumed the responsibility for issuing licenses for

uranium mining. In the Arizona licensure process, the Arizona Atomic Energy Commission administratively builds requirements into an application as it is processed. Thus, the concerns of the various Arizona state agencies are answered before a radioactive materials license is issued.

The rule-making authority given to the Department of Health and Environmental Sciences by the Radiation Control Act is quite broad:

(1) The Department is the state radiation control agency.
(2) Under the laws of this state, the Department may employ, compensate, and prescribe the powers and duties of the individuals which are necessary to carry out this act.
(3) The Department may for the protection of the occupational and public health and safety:
    (a) Develop and conduct programs for evaluation and control of hazards associated with the use of sources of ionizing radiation.
    (b) Develop programs and adopt rules with due regard for compatibility with federal programs for licensing and regulation of by-product, source, radioactive waste materials, and other radioactive materials. These rules shall cover equipment and facilities, methods for transporting, handling and storage of radioactive materials, permissible levels of exposure, technical qualifications of personnel, required notification of accidents and other incidents involving radioactive materials, survey methods and results, methods of disposal of radioactive materials, posting and labeling of areas, and sources, and methods, and effectiveness of controlling individuals in posted and restricted areas.
    (c) Adopt rules relating to control of other sources of ionizing radiation. These rules shall cover equipment and facilities, permissible levels of exposure to personnel, posting of areas, surveys, and records.

(d) Advise, consult, and co-operate with other agencies of the state, the federal government, other states, interstate agencies, political subdivisions, and with groups concerned with control of sources of ionizing radiation.

(e) Accept and administer loans, grants, or other funds or gifts, conditional or otherwise, in furtherance of its functions, from the federal government and from other sources, public or private.

(f) Encourage, participate in, or conduct studies, investigations, training, research, and demonstrations, relating to control of sources of ionizing radiation.

(g) Collect and disseminate information relating to control of sources of ionizing radiation, including:

(i) Maintenance of a file of all license applications, issuances, denials, amendments, transfers, renewals, modifications, suspensions, and revocations;

(ii) Maintenance of a file of registrants possessing sources of ionizing radiation requiring registration under this act and any administrative or judicial action pertaining thereto;

(iii) Maintenance of a file of all rules relating to regulation of sources of ionizing radiation, pending or adopted and proceedings thereon. [Emphasis added.]

-- Section 69-5804, R.C.M. 1947

Source material, by definition, includes uranium. Therefore, it is apparent that the state radiation control agency (Department of Health and Environmental Sciences) has been given the authority to adopt rules for licensing and regulation of uranium solution mining activities. No such rules have been adopted.

Water Pollution Act -- Additionally, the Department of Health and Environmental Sciences is charged with the responsibility of providing a comprehensive program for the prevention, abatement, and control of water pollution in the State of Montana.

Under the Water Pollution Act (Section 69-4801 *et seq.*, R.C.M. 1947), the Board of Health and Environmental Sciences is given rule-making authority to govern issuance of the permits which are required prior to the discharge of "...sewage, industrial wastes, or other wastes into any state waters." The Department of Health and Environmental Sciences has the correlative authority to issue, suspend, revoke, modify, or deny these permits consistent with the rules made by the Board. Such rules governing ground water are in the process of being drafted, but have not yet been adopted.

By statutory definition, the term "other wastes" includes "... all other substances that may pollute state waters." "Pollution" is defined as meaning:

> ...contamination ["impairment of the quality of state waters by sewage, industrial wastes, or other wastes creating a hazard to human health"], or other alteration of the physical, chemical, or biological properties of any state waters, which exceeds that permitted by Montana water quality standards, including, but not limited to, standards

> relating to change in temperature, taste, color, turbidity, or odor; or discharge of any liquid, gaseous, solid, radioactive, or other substance into any state water which will or is likely to create a nuisance or render the waters harmful, detrimental, or injurious to public health, recreation, safety, welfare, livestock, wild animals, birds, fish, or other wildlife.
>
> -- Section 69-4802, R.C.M. 1947.

If an aquifer is involved, the injection of a solution into the uranium ore-bearing body would result in discharge of waste into state waters. Therefore, the mining process, at least any portion of a process which would impair the quality of state water, would fall within the scope of the Water Pollution Act.

Conclusions, Recommendations

From the above discussion, it is apparent that the Board and the Department of Health and Environmental Sciences presently have the authority, under two separate legislative enactments, to regulate uranium solution mining in the State of Montana. Those entities have a broad grant of authority which could be exercised to provide both for the control of the extraction process and for the protection and rehabilitation of the waters thereby affected. Therefore, it does not appear that comprehensive uranium solution mining legislation need be enacted by the Legislature, but IT IS RECOMMENDED that the Department and the Board of Health and Environmental

Sciences exercise their existing rule-making authority to regulate uranium solution mining.

In addition, because it is not certain that the Board of Health and Environmental Sciences has sufficient authority to protect and rehabilitate the lands affected by uranium solution extraction, IT IS FURTHER RECOMMENDED that the 1977 Legislative Session consider giving the Board of Health and Environmental Sciences authority to adopt rules and regulations which would clearly provide for the protection and rehabilitation of the lands affected by uranium solution extraction operations.

IT IS FURTHER RECOMMENDED that the Major Facility Siting Act be amended to replace the phrase "enriching uranium minerals" with the phrase "isotope enrichment," thereby removing any doubt as to the type of facility covered by the Siting Act.

UNITED STATES OF AMERICA,)
State of Montana) ss.

I, FRANK MURRAY, Secretary of State of the State of Montana, do hereby certify that the following is a true and correct copy of SENATE Bill No. 374, Chapter No. 317, Montana Session Laws of 1975, enacted by the Forty-fourth Legislature of the State of Montana, approved by Thomas L. Judge, Governor of said State, on the eighth day of April, 1975, and effective immediately.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the great Seal of said State.

Done at the City of Helena, the Capital of said State, this fifteenth day of April, 1975.

Frank Murray

Frank Murray
Secretary of State

. . . . . .

CHAPTER NO. 317
MONTANA SESSION LAWS 1975
SENATE BILL NO. 374

AN ACT DIRECTING THE DEPARTMENT OF NATURAL RESOURCES TO MAKE RECOMMENDATIONS AND PROPOSE LEGISLATION TO PROVIDE FOR THE CONTROL OF URANIUM SOLUTION EXTRACTION AND THE PROTECTION AND REHABILITATION OF LANDS AND WATERS AFFECTED BY URANIUM SOLUTION EXTRACTION; AND TO PROVIDE AN IMMEDIATE EFFECTIVE DATE.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF MONTANA:

Section 1. There is a new R.C.M. section numbered 50-1701 that reads as follows:

50-1701. Statement of legislative findings and policy. The legislature, noting that the energy shortage has prompted a widespread search for energy resources; that there is substantially increased prospecting, exploration and land acquisition for uranium in Montana; that rising world prices make previously uneconomical uranium deposits economically recoverable; that many Montana uranium deposits are so deep or have such a configuration that economic recovery is only possible through extraction in-place; and that extraction and energy companies have shown interest in utilizing in-place leaching in Montana to recover uranium; and further noting that pilot projects involving solution extraction are being seriously undertaken in other states and that contamination of fresh water resources is occurring, finds that solution extraction of uranium constitutes a technologically feasible method of uranium extraction which threatens Montana's land and water resources to the detriment of existing and projected agricultural, recreational, domestic, and other uses. The legislature, pursuant to its mandate and authority under Article IX of the Montana constitution declares that it is the policy of the state to provide for the protection of the lands and waters of the state and therefore to make provisions for the control of uranium solution extraction and rehabilitation of lands and waters affected by this extraction.

Section 2. There is a new R.C.M. section numbered 50-1702 that reads as follows:

50-1702. Definitions. Unless the context clearly requires otherwise, in this act:

(1) "department" means the department of natural resources and conservation;

(2) "solution extraction" means any part of the process followed in the extraction of uranium by injection of a solvent into zones below the earth's surface and subsequent withdrawal of the solution and processing of uranium;

(3) "person" means a person, partnership, corporation, association, or other legal entity, or any political subdivision or agency of the state;

(4) "operation" means all of the premises, facilities, railroad loops or spurs, roads, injection or extraction wells, associated facilities, equipment, or any other surface or subsurface disturbance associated with or used in the process of solution extraction and processing uranium from a designated area.

Section 3. There is a new R.C.M. section numbered 50-1703 that reads as follows:

50-1703. Review by department. (1) The department shall review its authority and the authority of other state and federal agencies to control or regulate solution extraction of uranium.

(2) Upon completion of the review, the department shall prepare a report and make recommendations to the governor and to the 1977 legislature to accomplish the policy set forth in this act.

Section 4. There is a new R.C.M. section numbered 50-1704 that reads as follows:

50-1704. Suspension of action. No person may propose, initiate construction of or in any way undertake an operation for the purpose of solution extraction of uranium for a period of two (2) years from the effective date of this act.

Section 5. Severability. If a part of this act is invalid, all valid parts that are severable from the invalid part remain in effect. If a part of this act is invalid in one or more of its applications, the part remains in effect in all valid applications that are severable from the invalid applications.

Section 6. Effective date. This act is effective upon its passage and approval.